CONTENTS

NUMBER 54

R. M. SPANSWICK, J. STOLAREK, and E. J. WILLIAMS: The Membrane Potential of *Nitella translucens* 1

M. A. HAMPSON: Uptake of Radioactivity by Aquatic Plants and Location in the Cells. I 17

M. A. HAMPSON: Uptake of Radioactivity by Aquatic Plants and Location in the Cells. II 34

I. MORRIS: The Effect of Cycloheximide (Actidione) on Protein and Nucleic Acid Synthesis by *Chlorella* 54

A. K. SETH and P. F. WAREING: Hormone-directed Transport of Metabolites and its possible Role in Plant Senescence . . 65

P. B. GOODWIN: The Control of Branch Growth on Potato Tubers. I. Anatomy of Buds in Relation to Dormancy and Correlative Inhibition 78

P. B. GOODWIN: The Control of Branch Growth on Potato Tubers. II. The Pattern of Sprout Growth 87

J. G. VAUGHAN and A. WAITE: Comparative Electrophoretic Studies of the Seed Proteins of Certain Species of *Brassica* and *Sinapis* 100

R. THAINE, M. C. PROBINE, and P. Y. DYER: The Existence of Transcellular Strands in Mature Sieve Elements . . . 110

M. J. MERRETT and K. H. GOULDING: Short-term Products of ^{14}C-acetate Assimilation by *Chlorella pyrenoidosa* in the Light 128

K. W. JOY: Carbon and Nitrogen Sources for Protein Synthesis and Growth of Sugar-beet Leaves 140

P. B. GAHAN, J. MCLEAN, M. KALINA, and W. SHARMA: Freezing-Sectioning of Plant Tissues: The Technique and its Use in Plant Histochemistry 151

L. K. WIERSUM: The Mass-flow Theory of Phloem Transport; A Supporting Calculation 160

D. A. BARBER: The Effect of Micro-organisms on the Absorption of Inorganic Nutrients by Intact Plants. I. Apparatus and Culture Technique 163

D. A. BARBER and B. C. LOUGHMAN: The Effect of Micro-organisms on the Absorption of Inorganic Nutrients by Intact Plants. II. Uptake and Utilization of Phosphate by Barley Plants Grown under Sterile and Non-sterile Conditions . 170

CONTENTS

NUMBER 54

R. M. SPANSWICK, J. STOLAREK, and E. J. WILLIAMS: The Membrane Potential of *Nitella translucens* 1

M. A. HAMPSON: Uptake of Radioactivity by Aquatic Plants and Location in the Cells. I 17

M. A. HAMPSON: Uptake of Radioactivity by Aquatic Plants and Location in the Cells. II 34

I. MORRIS: The Effect of Cycloheximide (Actidione) on Protein and Nucleic Acid Synthesis by *Chlorella* 54

A. K. SETH and P. F. WAREING: Hormone-directed Transport of Metabolites and its possible Role in Plant Senescence . . 65

P. B. GOODWIN: The Control of Branch Growth on Potato Tubers. I. Anatomy of Buds in Relation to Dormancy and Correlative Inhibition 78

P. B. GOODWIN: The Control of Branch Growth on Potato Tubers. II. The Pattern of Sprout Growth 87

J. G. VAUGHAN and A. WAITE: Comparative Electrophoretic Studies of the Seed Proteins of Certain Species of *Brassica* and *Sinapis* 100

R. THAINE, M. C. PROBINE, and P. Y. DYER: The Existence of Transcellular Strands in Mature Sieve Elements . . . 110

M. J. MERRETT and K. H. GOULDING: Short-term Products of ^{14}C-acetate Assimilation by *Chlorella pyrenoidosa* in the Light 128

K. W. JOY: Carbon and Nitrogen Sources for Protein Synthesis and Growth of Sugar-beet Leaves 140

P. B. GAHAN, J. MCLEAN, M. KALINA, and W. SHARMA: Freezing-Sectioning of Plant Tissues: The Technique and its Use in Plant Histochemistry 151

L. K. WIERSUM: The Mass-flow Theory of Phloem Transport; A Supporting Calculation 160

D. A. BARBER: The Effect of Micro-organisms on the Absorption of Inorganic Nutrients by Intact Plants. I. Apparatus and Culture Technique 163

D. A. BARBER and B. C. LOUGHMAN: The Effect of Micro-organisms on the Absorption of Inorganic Nutrients by Intact Plants. II. Uptake and Utilization of Phosphate by Barley Plants Grown under Sterile and Non-sterile Conditions . 170

HANS MEIDNER: Further Observations on the Minimum Intercellular Space Carbon Dioxide Concentration (Γ) of Maize Leaves and the Postulated Roles of 'Photo-respiration' and Glycollate Metabolism 177

NUMBER 55

D. F. WESTLAKE: Some Effects of Low-velocity Currents on the Metabolism of Aquatic Macrophytes 187

M. G. MULLINS: Morphogenetic Effects of Roots and of Some Synthetic Cytokinins in *Vitis vinifera* L. 206

E. A. COSSINS and S. K. SINHA: Studies of Glycollate Utilization and some Associated Enzymes of C_1 Metabolism in the Endosperm of *Ricinus communis* L. 215

C. T. WHEELER and D. BOULTER: Nucleic Acids of Developing Seeds of *Vicia faba* L. 229

J. BRADLEY and E. J. WILLIAMS: Chloride Electrochemical Potentials and Membrane Resistances in *Nitella translucens* . 241

J. S. COLE: Some Effects of the Environment on the Temperature of Tobacco Leaves in Field Plots in Rhodesia 254

J. G. VAUGHAN and A. WAITE: Comparative Electrophoretic Studies of the Seed Proteins of Certain Amphidiploid Species of *Brassica* 269

A. C. HULME, M. J. C. RHODES, and L. S. C. WOOLTORTON: The Inhibition of the Activity of Apple Mitochondria by Oxaloacetate 277

P. B. GOODWIN and P. E. CANSFIELD: The Control of Branch Growth on Potato Tubers. III. The Basis of Correlative Inhibition 297

B. ORCHARD: Water Deficit and the Growth of Crop Seedlings. I. The Effect of Rate of Change of Soil Water Content on Kale Seedlings 308

CURTIS V. GIVAN and H. A. COLLIN: Studies on the Growth in Culture of Plant Cells. II. Changes in Respiration Rate and Nitrogen Content Associated with the Growth of *Acer pseudoplatanus* L. Cells in Suspension Culture 321

D. C. DAVENPORT: Effects of Chemical Antitranspirants on Transpiration and Growth of Grass 332

F. A. SMITH: Links between Glucose Uptake and Metabolism in *Nitella translucens* 348

J. C. Green and D. H. Jennings: A Physical and Chemical Investigation of the Scales produced by the Golgi Apparatus within and found on the surface of the cells of *Chrysochromulina chiton* Parke et Manton 359

D. Lewis, Sheila Burrage, and D. Walls: Immunological Reactions of Single Pollen Grains, Electrophoresis and Enzymology of Pollen Protein Exudates 371

NUMBER 56

D. J. Avery: The Temperatures of Leaves in Assimilation Chambers, and in the Open 379

John C. Mickelson, Edith B. Davis, and R. G. Tischer: The Effect of Various Nitrogen Sources upon Heterocyst Formation in *Anabaena Flos-Aquae* A37 397

J. Ford and A. J. Peel: Preliminary Experiments on the Effect of Temperature on the Movement of ^{14}C-labelled Assimilates through the Phloem of Willow 406

Elizabeth Williams: The Gamete Pigments of *Hormosira banksii* (*Phaeophyta*) 416

F. L. Milthorpe and H. L. Penman: The Diffusive Conductivity of the Stomata of Wheat Leaves 422

R. M. M. Crawford: Alcohol Dehydrogenase Activity in Relation to Flooding Tolerance in Roots 458

G. Evans and N. H. White: Effect of the Antibiotics Radicicolin and Griseofulvin on the Fine Structure of Fungi 465

I. W. Selman and S. Kulasegaram: Development of the Stem Tuber in Kohlrabi 471

R. Scott Russell and J. Sanderson: Nutrient Uptake by Different Parts of the Intact Roots of Plants 491

F. A. Smith: Rates of Photosynthesis in Characean Cells. I. Photosynthetic $^{14}CO_2$ Fixation by *Nitella translucens* . . . 509

D. M. Griffin, N. G. Nair, R. I. Baxter, and D. E. Smiles: Control of Gaseous Environment of Organisms using a Diffusion Column Technique 518

R. J. Lewington, Mary Talbot, and E. W. Simon: The Yellowing of Attached and Detached Cucumber Cotyledons . 526

R. D. Butler: The Fine Structure of Senescing Cotyledons of Cucumber 535

68 99 AA A 30

W. P. ANDERSON and C. R. HOUSE: A Correlation between Structure and Function in the Root of *Zea mays* 544

359 HANS MEIDNER: The Effect of Kinetin on Stomatal Opening and the Rate of Intake of Carbon Dioxide in Mature Primary Leaves of Barley 556

371

NUMBER 57

D. S. FENSOM and I. R. WANLESS: Further Studies of Electro-Osmosis in *Nitella* in Relation to Pores in Membranes . . 563

379 D. VAUGHAN and I. R. MACDONALD: Invertase Development in Storage Tissue Disks of *Beta vulgaris*; its Nature, Extent, and Location 578

397 D. VAUGHAN and I. R. MACDONALD: The Effect of Inhibitors on the Increase in Invertase Activity and RNA Content of Beet Disks During Ageing 587

406 JOHN SINCLAIR: Nernst Potential Measurements on the Leaf Cells of the Moss, *Hookeria lucens* 594

416 A. J. PEEL: Demonstration of Solute Movement from the Extracambial Tissues into the Xylem Stream in Willow . . 600

422 J. FORD and A. J. PEEL: The Movement of Sugars into the Sieve Elements of Bark Strips of Willow 607

458 K. H. GOULDING and M. J. MERRETT: The Role of Glycollic Acid in the Photoassimilation of Acetate by *Chlorella pyrenoidosa* 620

465 D. A. BARBER and M. G. T. SHONE: The Initial Uptake of Ions by Barley Roots. III. The Uptake of Cations . . . 631

471 B. R. BUTTERY and S. G. BOATMAN: Effects of Tapping, Wounding, and Growth Regulators on Turgor Pressure in *Hevea*
491 *brasiliensis* Muell. Arg. 644

J. E. DALE: Growth Changes in Disks Cut from Young Leaves
509 of *Phaseolus* 660

HAROLD G. WAGER: The Incorporation of $^{14}CO_2$ into Green Peas in the Dark 672

518 BRIAN COLMAN and HAROLD G. WAGER: The Labelling of Malic and Citric Acids of Pea Leaves and Cotyledons of Germinating
526 Peas by $^{14}CO_2$ in the Dark 692

P. JARVIS and C. R. HOUSE: The Radial Exchange of Labelled
535 Water in Maize Roots 695

H. F. Van Emden and K. E. Cockshull: The Effects of Soil Applications of (2-Chloroethyl)-trimethylammonium Chloride on Leaf Area and Dry Matter Production by the Brussels Sprout Plant 707

F. A. Smith: The Control of Na Uptake into *Nitella translucens* 716

A. F. H. Marker and C. P. Whittingham: The Site of Synthesis of Sucrose in Green Plant Cells 732

F. A. L. Clowes: Synthesis of DNA during Mitosis . . 740

O. V. S. Heath and Hans Meidner: Compensation Points and Carbon Dioxide Enrichment for Lettuce Grown Under Glass in Winter 746

A. G. Smithers and J. F. Sutcliffe : The Influence of External Concentration on Sodium Ion Absorption by Carrot Root Tissue Cultures 752

A. G. Smithers and J. F. Sutcliffe: Effects of Cyanide on Respiration, Growth, and Potassium Absorption by Carrot Root Tissue Cultures 758

INDEX TO VOLUME 18

ANDERSON, W. P., and HOUSE, C. R. A Correlation between Structure and Function in the Root of *Zea mays* 544

AVERY, D. J. The Temperatures of Leaves in Assimilation Chambers, and in the Open 379

BARBER, D. A. The Effect of Micro-organisms on the Absorption of Inorganic Nutrients by Intact Plants. I. Apparatus and Culture Technique . . 163

BARBER, D. A., and LOUGHMAN, B. C. The Effect of Micro-organisms on the Absorption of Inorganic Nutrients by Intact Plants. II. Uptake and Utilization of Phosphate by Barley Plants Grown under Sterile and Non-sterile Conditions 170

BARBER, D. A., and SHONE, M. G. T. The Initial Uptake of Ions by Barley Roots. III. The Uptake of Cations 631

BAXTER, R. I., *see* GRIFFIN, D. M.

BOATMAN, S. G., *see* BUTTERY, B. R.

BOULTER, D. A., *see* WHEELER, C. T.

BRADLEY, J., and WILLIAMS, E. J. Chloride Electrochemical Potentials and Membrane Resistances in *Nitella translucens* 241

BURRAGE, SHEILA, *see* LEWIS, D.

BUTLER, R. D. The Fine Structure of Senescing Cotyledons of Cucumber . 535

BUTTERY, B. R., and BOATMAN, S. G. Effects of Tapping, Wounding, and Growth Regulators on Turgor Pressure in *Hevea brasiliensis* Muell. Arg. . . 644

CANSFIELD, P. E., *see* GOODWIN, P. D.

CLOWES, F. A. L. Synthesis of DNA during Mitosis 740

COCKSHULL, K. E., *see* VAN EMDEN, H. F.

COLE, J. S. Some Effects of the Environment on the Temperature of Tobacco Leaves in Field Plots in Rhodesia 254

COLLIN, H. A., *see* GIVAN, C. V.

COLMAN, B., and WAGER, H. G. The Labelling of Malic and Citric Acids of Pea Leaves and Cotyledons of Germinating Peas by $^{14}CO_2$ in the Dark . 692

COSSINS, E. A., and SINHA, S. K. Studies of Glycollate Utilization and some Associated Enzymes of C_1 Metabolism in the Endosperm of *Ricinus communis* L. 215

CRAWFORD, R. M. M. Alcohol Dehydrogenase Activity in Relation to Flooding Tolerance in Roots 458

DALE, J. E. Growth Changes in Disks Cut from Young Leaves of *Phaseolus* . 660

DAVENPORT, D. C. Effects of Chemical Antitranspirants on Transpiration and Growth of Grass 332

DAVIS, EDITH B., *see* MICKELSON, J.

DYER, P. Y., *see* THAINE, R.

EVANS, G., and WHITE, N. H. Effect of the Antibiotics Radicicolin and Griseofulvin on the Fine Structure of Fungi 465

FENSOM, D. S., and WANLESS, I. R. Further Studies of Electro-Osmosis in *Nitella* in Relation to Pores in Membranes 563

FORD, J., and PEEL, A. J. Preliminary Experiments on the Effect of Temperature on the Movement of ^{14}C-labelled Assimilates through the Phloem of Willow 406

FORD, J., and PEEL, A. J. The Movement of Sugars into the Sieve Elements of Bark Strips of Willow 607

GAHAN, P. B., MCLEAN, J., KALINA, M., and SHARMA, W. Freezing-Sectioning of Plant Tissues: The Technique and its Use in Plant Histochemistry . 151

GIVAN, C. V., and COLLIN, H. A. Studies on the Growth in Culture of Plant Cells. II. Changes in the Respiration Rate and Nitrogen Content Associated with the Growth of *Acer pseudoplatanus* L. Cells in Suspension Culture 321

GOODWIN, P. B. The Control of Branch Growth on Potato Tubers. I. Anatomy of Buds in Relation to Dormancy and Correlative Inhibition . . . 78

GOODWIN, P. B. The Control of Branch Growth on Potato Tubers. II. The Pattern of Sprout Growth 87

GOODWIN, P. B., and CANSFIELD, P. E. The Control of Branch Growth on Potato Tubers. III. The Basis of Correlative Inhibition 297

GOULDING, K. H., and MERRETT, M. J. The Role of Glycollic Acid in the Photoassimilation of Acetate by *Chlorella pyrenoidosa* 620

GOULDING, K. H., *see* MERRETT, M. J.

GREEN, J. C., and JENNINGS, D. H. A Physical and Chemical Investigation of the Scales produced by the Golgi Apparatus within and found on the Surface of the Cells of *Chrysochromulina chiton* Parke et Manton 359

GRIFFIN, D. M., NAIR, N. G., BAXTER, R. I., and SMILES, D. E. Control of Gaseous Environment of Organisms using a Diffusion Column Technique . 518

HAMPSON, M. A. Uptake of Radioactivity by Aquatic Plants and Location in the Cells. I. 17

HAMPSON, M. A. Uptake of Radioactivity by Aquatic Plants and Location in the Cells. II 34

HEATH, O. V. S., and MEIDNER, HANS. Compensation Points and Carbon Dioxide Enrichment for Lettuce Grown Under Glass in Winter . . . 746

HOUSE, C. R., *see* ANDERSON, W. P.

HOUSE, C. R., *see* JARVIS, P.

HULME, A. C., RHODES, M. J. C., and WOOLTORTON, L. S. C. The Inhibition of the Activity of Apple Mitochondria by Oxaloacetate 277

JARVIS, P., and HOUSE, C. R. The Radial Exchange of Labelled Water in Maize Roots 695

JENNINGS, D. H., *see* GREEN, J. C.

JOY, K. W. Carbon and Nitrogen Sources for Protein Synthesis and Growth of Sugar-beet Leaves 140

KALINA, M., *see* GAHAN, P. B.

KULASEGARAM, S., *see* SELMAN, I. W.

LEWINGTON, R. J., TALBOT, MARY, and SIMON, E. W. The Yellowing of Attached and Detached Cucumber Cotyledons 526

LEWIS, D., BURRAGE, SHEILA, and WALLS, D. Immunological Reactions of Single Pollen Grains, Electrophoresis and Enzymology of Pollen Protein Exudates 371

LOUGHMAN, B. C., *see* BARBER, D. A.

MACDONALD, I. R., *see* VAUGHAN, D.

MCLEAN, J., *see* GAHAN, P. B.

MARKER, A. F. H., and WHITTINGHAM, C. P. The Site of Synthesis of Sucrose in Green Plant Cells 732

MEIDNER, HANS. Further Observations on the Minimum Intercellular Space Carbon Dioxide Concentration (Γ) of Maize Leaves and the Postulated Roles of 'Photo-respiration' and Glycollate Metabolism 177

MEIDNER, HANS. The Effect of Kinetin on Stomatal Opening and the Rate of Intake of Carbon Dioxide in Mature Primary Leaves of Barley . . . 556

MEIDNER, HANS, *see* HEATH, O. V. S.

MERRETT, M. J., and GOULDING, K. H. Short-term Products of ^{14}C-acetate Assimilation by *Chlorella pyrenoidosa* in the Light 128

MERRETT, M. J., *see* GOULDING, K. H.

MICKELSON, J. C., DAVIS, EDITH B., and TISCHER, R. G. The Effect of Various Nitrogen Sources upon Heterocyst Formation in *Anabaena Flos-Aquae* A37 397

MILTHORPE, F. L., and PENMAN, H. L. The Diffusive Conductivity of the Stomata of Wheat Leaves 422

MORRIS, I. The Effect of Cycloheximide (Actidione) on Protein and Nucleic Acid Synthesis by *Chlorella* 54

MULLINS, M. G. Morphogenetic Effects of Roots and of Some Synthetic Cytokinins in *Vitis vinifera* L 206

NAIR, N. G., *see* GRIFFIN, D. M.

ORCHARD, B. Water Deficit and the Growth of Crop Seedlings. I. The Effect of Rate of Change of Soil Water Content on Kale Seedlings 308

PEEL, A. J. Demonstration of Solute Movement from the Extracambial Tissues into the Xylem Stream in Willow 600

PEEL, A. J., *see* FORD, J.

PENMAN, H. L., *see* MILTHORPE, F. L.

PROBINE, M. C., *see* THAINE, R.

RHODES, M. J. S., *see* HULME, A. C.

SANDERSON, J., *see* SCOTT RUSSELL, R.

SELMAN, I. W., and KULASEGARAM, S. Development of the Stem Tuber in Kohlrabi 471

SETH, A. K., and WAREING, P. F. Hormone-directed Transport of Metabolites and its possible Role in Plant Senescence 65

SCOTT RUSSELL, R., and SANDERSON, J. Nutrient Uptake by Different Parts of the Intact Roots of Plants 491

SHARMA, W., *see* GAHAN, P. B.

SHONE, M. G. T., *see* BARBER, D. A.

SIMON, E. W., *see* LEWINGTON, R. J.

SINCLAIR, J. Nernst Potential Measurements on the Leaf Cells of the Moss, *Hookeria lucens* 594

SINHA, S. K., *see* COSSINS, E. A.

SMILES, D. E., *see* GRIFFIN, D. M.

SMITH, F. A. Links between Glucose Uptake and Metabolism in *Nitella translucens* 348

SMITH, F. A. Rates of Photosynthesis in Characean Cells. I. Photosynthetic $^{14}CO_2$ Fixation by *Nitella translucens* 509

SMITH, F. A. The Control of Na Uptake into *Nitella translucens* . . . 716

SMITHERS, A. G., and SUTCLIFFE, J. F. The Influence of External Concentration on Sodium Ion Absorption by Carrot Root Tissue Cultures . . . 752

SMITHERS, A. G., and SUTCLIFFE, J. F. Effects of Cyanide on Respiration, Growth, and Potassium Absorption by Carrot Root Tissue Cultures . . 758

SPANSWICK, R. M., STOLAREK, J., and WILLIAMS, E. J. The Membrane Potential of *Nitella translucens* 1

STOLAREK, J., *see* SPANSWICK, R. M.

SUTCLIFFE, J. F., *see* SMITHERS, A. G.

TALBOT, MARY, *see* LEWINGTON, R. J.

THAINE, R., PROBINE, M. C., and DYER, P. Y. The Existence of Transcellular Strands in Mature Sieve Elements 110

TISCHER, R. G., *see* MICKELSON, J. C.

VAN EMDEN, H. F., and COCKSHULL, K. E. The Effects of Soil Applications of (2-Chloroethyl)-trimethylammonium Chloride on Leaf Area and Dry Matter Production by the Brussels Sprout Plant 707

VAUGHAN, D., and MACDONALD, I. R. Invertase Development in Storage Tissue Disks of *Beta vulgaris*, its Nature, Extent, and Location 578

VAUGHAN, D., and MACDONALD, I. R. The Effect of Inhibitors on the Increase in Invertase Activity and RNA Content of Beet Disks During Ageing . 587

VAUGHAN, J. D., and WAITE, A. Comparative Electrophoretic Studies of the Seed Proteins of Certain Species of *Brassica* and *Sinapis* 100

VAUGHAN, J. D., and WAITE, A. Comparative Electrophoretic Studies of the Seed Proteins of Certain Amphidiploid Species of *Brassica* 269

WAGER, H. G. The incorporation of $^{14}CO_2$ into Green Peas in the Dark . 672

WAGER, H. G., *see* COLMAN, B.

WAITE, A., *see* VAUGHAN, J. G.

WALLS, D., *see* LEWIS, D.

WANLESS, I. R., *see* FENSOM, D. S.

WAREING, P. F., *see* SETH, A. K.

WESTLAKE, D. F. Some Effects of Low-velocity Currents on the Metabolism of Aquatic Macrophytes 187

WHEELER, C. T., and BOULTER, D. Nucleic Acids of Developing Seeds of *Vicia faba* L. 229

WHITE, N. H., *see* EVANS, G.

WHITTINGHAM, C. P., *see* MARKER, A. F. H.

WIERSUM, L. K. The Mass-flow Theory of Phloem Transport; A Supporting Calculation 160

WILLIAMS, E. The Gamete Pigments of *Hormosira banksii* (*Phaeophyta*) . 416

WILLIAMS, E. J., *see* SPANSWICK, R. M.

WILLIAMS, E. J., *see* BRADLEY, J.

WOOLTORTON, L. S. C., *see* HULME, A. C.